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IS 12448-2-4 (1988): Basic testing procedures and measuring methods for electromechanical components for electronic equipment, Part 2: General examination, electrical continuity and contact resistance tests, insulation tests, voltage stress tests, Section 4: Voltage stress tests [LITD 3: Electromechanical Components and Mechanical Structures

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“Knowledge is such a treasure which cannot be stolen”





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Indian Standard

# BASIC TESTING PROCEDURES AND MEASURING METHODS FOR ELECTROMECHANICAL COMPONENTS FOR ELECTRONIC EQUIPMENT

## PART 2 GENERAL EXAMINATION, ELECTRICAL CONTINUITY AND CONTACT RESISTANCE TESTS, INSULATION TESTS AND VOLTAGE STRESS TESTS

### Section 4 Voltage Stress Tests

**1. Scope** — This standard ( Part 2/Sec 4 ) covers voltage withstand test for electromechanical components.

**2. Test 4a: Voltage Proof**

**2.1 Object** — The object of this test is to determine the ability of a component to withstand specified test voltage applied in a specified manner.

**2.2 Mounting of Specimen** — The specimen shall be mounted in accordance with the detail specification.

**2.3 Test Methods** — A dc or ac peak test voltage shall be applied for  $60 \pm 5$  s using method A, B or C, as specified in the detail specification.

If an ac test voltage is used, it shall have a frequency of 45 to 60 Hz and shall be approximately sinusoidal in waveform. The rate of application of test voltage shall not exceed 500 V/s.

**2.3.1 Method A** — The specimen shall be subjected to the test voltage as specified in the detail specification, between each termination in turn and the housing and/or the mounting plate, all other terminations being connected together and to the housing and/or the mounting plate.

**2.3.2 Method B** — Alternate terminations shall be connected together. Where practical, no one group shall contain adjacent contacts.

**Note** — In the case of terminations arranged in two or more rows, it will be necessary to form a second arrangement of two groups in order to measure the withstand voltage of each pair of adjacent terminations.

The specimen shall be subjected to the test voltage as specified in turn, between the following:

- The first group of terminations and the second group connected to the housing and/or the mounting plate, and
- The second group of terminations and the first group connected to the housing and/or the mounting plate.

**2.3.3 Method C** — The specimen shall be subjected to the test voltage between adjacent terminations, as specified by the detail specification.

**2.4 Test Requirements** — There shall be no breakdown or flashover and maximum permissible leakage current shall not be exceeded when the voltage specified by the detail specification is applied.

**2.5 Details to be Specified** — When this test is required by the detail specification, the following details shall be specified:

- Method to be used;
- Value and nature of the test voltage;
- Maximum permissible leakage current, where applicable;
- Contacts to be tested;
- Environmental conditions;

- f) Operated conditions in the case of switches; and
- g) Any deviation from the standard test method and/or conditions.

Note — Reduced voltage values should apply for altitude, low air pressure and temperature conditions based on the tables of derating factors stated in the relevant general requirement specification.

### 3. Test 4b: Partial Discharge

**3.1 Object** — The object of this test is to detail a standard method to assess the ability of an electromechanical component to be used under specified voltage conditions without showing partial discharges.

Note — This test is basically the same as the one given in IS : 6209-1982\*. The measuring circuit, however, is dimensioned such as to meet the specific requirements of electromechanical components having relatively small inductances and capacitances.

#### 3.2 Test Method

**3.2.1 Test equipment** — The partial discharge extinction voltage shall be measured with the basic circuit shown in Fig. 1.

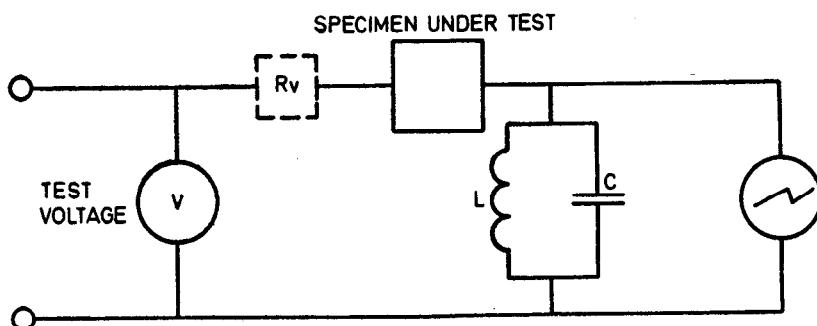


FIG. 1 BASIC CIRCUIT FOR PARTIAL DISCHARGE EXTINCTION VOLTAGE

The values of the equipment shown in Fig. 1 shall be as follows:

- a) Frequency band of the oscilloscope: 500 kHz
- b) Sensitivity of the oscilloscope: 2 to 10 mm/mV
- c) Time base scale: 2 ms/Division
- d) Inductance  $L$ : 20 to 40 mH
- e) Capacitance  $C$  (including the capacitance of the oscilloscope, wiring and coil): 80 to 120 pF
- f) Frequency of test voltage: 40 to 60 Hz.

If required, a current-limiting resistor ( $R_v$ ) may be used. To minimize the influence of the measuring set-up, low-impedance coupling and, if necessary, an amplifier may be used.

Care must be taken to ensure that the cable/wire used is capable of meeting a higher requirement than the specimen under test.

**3.2.2 Test procedure** — The test voltage shall be applied and steadily increased up to a value where partial discharges are observed on the oscilloscope. In order to determine the partial discharge extinction voltage, the test value of the voltage shall then be noted.

The test voltage shall in no case exceed the proof voltage as specified for the application of Test 4a.

**3.3 Requirements** — The partial discharge extinction voltage shall be not less than that specified in the detail specification.

If no discharge occurs below the proof voltage, the specimen shall also have passed the test.

**3.4 Details to be Specified** — When this test is required by the detail specification, the following details shall be specified:

- a) Preparation of the specimen, including cable/wire to be used;
- b) Operated conditions;

\*Methods for partial discharge measurements (first revision).

- c) Minimum extinction voltage;
- d) Proof voltage; and
- e) Any deviation from the standard test method.

#### **4. Test 4c: Voltage Proof of Pre-Insulated Crimp Barrels**

**4.1 Object** — The object of this test is to detail a standard method to determine the ability of pre-insulated crimp barrels to withstand the crimp operation without damage to the insulation.

**4.2 Preparation of the Specimen** — The specimen shall consist of a crimp contact or a terminal, and having a pre-insulated crimp barrel and the appropriate cable/wire, and shall be prepared in accordance with the detail specification.

The cable/wire, stripped as specified, shall be fitted to the crimp barrel and then crimped in the normal manner. The conductive area of the contact/terminal end and the end of the conductor to which it is attached shall be sealed, for example, by beeswax or other suitable sealing compound, ensuring that the sealing used does not cover the area of contact deformed by the crimping tool.

**4.3 Test Method** — The end of the specimen with the contact/terminal end shall be immersed in a 5 percent aqueous sodium chloride solution to a depth such as to cover the crimp indentations but not immerse the open end.

A voltage shall be applied between the specimen and an immersed electrode placed at a distance not more than 50 mm from the specimen. The voltage shall be steadily increased at a rate not exceeding 500 V/s up to the proof voltage specified in the detail specification and kept at the value for  $60 \pm 5$  s.

**4.4 Requirement** — There shall be no breakdown.

**4.5 Details to be Specified** — When this test is required by the detail specification, the following details shall be specified:

- a) Preparation of the specimen,
- b) Cable/wire to be used,
- c) Type and die setting of crimping tool,
- d) Proof voltage, and
- e) Any deviation from this standard test method.

#### **E X P L A N A T O R Y N O T E**

This standard ( Part 2/Sec 4 ) is based, without any technical change, on IEC Publication 512-2 ( 1985 ). 'Electromechanical components for electronic equipment; Basic testing procedures and measuring methods: Part 2 General examination, electrical continuity and contact resistance tests, insulation tests and voltage stress tests', issued by the International Electrotechnical Commission ( IEC ).